

calculate estimates of the prevalence of smoking in any particular time period. However, it is possible to use these data sources to examine general patterns of smoking during pregnancy. In general, women in the lowest age and socioeconomic categories have the highest likelihood of smoking during pregnancy.

The earliest data available to examine these patterns are from the Collaborative Perinatal Study (Niswander and Gordon 1972), which included women who obtained prenatal care at selected university centers in the early 1960s. White women were more likely to smoke than black women (53 percent versus 43 percent), and among smokers, whites smoked more cigarettes per day than blacks. By comparison, the national prevalence of smoking among women 25 to 44 years of age was 44 percent in 1965 (NCHS 1988c).

The National Survey of Family Growth (NSFG) collected data in 1982 on the smoking behavior of women, 15 to 44 years of age, during their most recent pregnancy, regardless of when the pregnancy occurred (NCHS 1988a). Of these women, 32 percent smoked during the pregnancy. Women who were aged 15 to 19 years when pregnant, who had less than 12 years of education, who were at 149 percent or less of poverty level, or who were unmarried had the highest smoking rates.

In the 1985 NHIS, questions related to smoking were asked of women aged 18 to 44 years who had given birth within the past 5 years (NCHS 1988b). Of these women, 32 percent reported having smoked during the 12 months preceding the birth; 21 percent of smokers reported quitting smoking and 36 percent reported reducing the number of cigarettes smoked after learning they were pregnant. Women under 25 years of age, with low income, of black race, unmarried, or unemployed were more likely to smoke than others. These same groups of women were less likely to quit smoking or to reduce the number of cigarettes smoked.

The 1990 Health Objectives for the Nation (US DHHS 1980a) state that "The proportion of women who smoke during pregnancy should be no greater than one-half the proportion of women overall who smoke." At the time of the midcourse review of the objectives (US DHHS 1986c), no data were available to evaluate progress directly. According to the 1985 NHIS, approximately 31 percent of women aged 18 to 44 years smoked cigarettes in 1985 (31.7 percent of 18- to 29-year-olds and 31.2 percent of 30- to 44-year-olds) (NCHS 1988c). In the same survey, as mentioned above, 32 percent of women who had given birth in the preceding 5 years reported smoking in the 12 months preceding the birth, 21 percent of whom reportedly quit after learning they were pregnant. This indirect evidence seems to indicate that the smoking prevalence among pregnant women was much more than half the prevalence among nonpregnant women in the early 1980s. Unless major changes in smoking behavior have occurred in the latter half of the decade, the 1990 objective will not be met. Analysis of data from the Behavioral Risk Factor Surveillance System supports this conclusion (Williamson et al. 1989).

#### Special Populations: Military Personnel

In 1980, 1982, 1985, and 1988, the Department of Defense (DOD) performed worldwide surveys of alcohol and nonmedical drug use among military personnel.

These surveys assessed cigarette smoking among personnel by asking, "During the past 30 days, how many packs of cigarettes did you usually smoke during a typical day?" (The 1980 survey question used the phrase "in one day.") There were five possible responses: 3 or more packs; 2 or more, but less than 3 packs; 1 or more, but less than 2 packs; less than 1 pack, but smoked some; did not smoke in the past 30 days. Sample sizes ranged from 15,000 to 21,000. The number of military installations participating in the surveys ranged from 58 to 81. The surveyed population was proportionally representative of all DOD active duty members for sex, race/ethnicity, marital status, education, and age (Herbold 1987; US DOD 1987, 1988).

Overall smoking prevalence among military personnel declined steadily from 53 percent in 1982 to 46 percent in 1985 to 42 percent in 1988 (Table 6). These prevalence figures, although declining, are considerably higher than among all males or young males in the general population (Tables 3 and 18). This disparity may reflect socioeconomic differences between military personnel and the general population, although one study suggests that smoking initiation may often occur among recruits after entering the military (see below). The 1988 estimates for the individual military branches were: Air Force, 37 percent; Marine Corps, 42 percent; Army, 44 percent; and Navy, 45 percent (US DOD 1988).

**TABLE 6.—Prevalence of cigarette smoking among U.S. military personnel, 1980, 1982, 1985, and 1988**

Rank <sup>b</sup>	Percentage of current smokers <sup>a</sup>			
	1980 (N=15,016)	1982 (N=21,412)	1985 (N=17,328)	1988 <sup>c</sup> (N=18,673)
E1-3	55	56	47	47
E4-6	55	55	52	45
E7-9	56	61	56	48
W1-4			40	34
O1-O3				19
O1-O2	24	25	17	
O3	23	24	18	
O4-O10			21	20
O4-O6	27	28		
Total	52	53	46	42

<sup>a</sup>Persons who had smoked cigarettes during the past 30 days.

<sup>b</sup>In ascending rank, from enlisted personnel (E1-9) to warrant officers (W1-4) to commissioned officers (O1-O10).

<sup>c</sup>Preliminary data (not adjusted for nonrespondents).

SOURCE: Herbold (1987); US DOD (1986, 1987, 1988).

Smoking prevalence rates among enlisted personnel (ranks E1–9) are at least twice the rates among commissioned officers in each survey year (Table 6). In 1988, for instance, smoking prevalence estimates ranged from 47 percent for the lowest ranks of enlisted personnel (E1–3) to 20 percent for the higher ranks of commissioned officers (O4–O10). The proportion of smokers smoking a pack or more a day was 55 percent; there was no consistent association between this proportion and military rank (US DOD 1988).

Cronan and Conway (1987) collected smoking information from 687 recruits entering the Navy and from 1,357 Navy servicemen stationed aboard ships in the San Diego area. The prevalence of smoking was 27.6 percent among recruits and 49.8 percent among shipboard men. The investigators concluded that the Navy is not attracting a higher than expected percentage of smokers from the U.S. population, but that many men start to smoke after they enter the Navy.

Reasons for higher smoking rates among military personnel include the inexpensive price of cigarettes in military facilities, peer pressure heightened by conditions of group living, stress, boredom, and lack of other forms of recreation (Cronan and Conway 1987; Blake 1985). In addition, there has been a historical connection between cigarettes and the military: cigarettes have been a part of the K-rations and C-rations provided to soldiers and sailors, and cigarette advertisements on radio and in the print media during World War II commonly featured military themes (Blake 1985). Cigarette advertising continues to appear in military-oriented publications (Davis 1987). In September 1988, Philip Morris Tobacco Company began to publish a monthly newsletter, “Military Smoker,” which features articles opposing restrictions on smoking and on cigarette sales in military facilities; readers are urged to call a toll-free “Military Smoker” hotline telephone number (Philip Morris 1988).

Recent DOD initiatives to reduce smoking among military personnel are described in Chapter 6.

## State-Specific Smoking Prevalence

### *Behavioral Risk Factor Surveillance System: 1982–87*

The Behavioral Risk Factor Surveillance System (BRFS) has provided State-specific smoking prevalence estimates for adults 18 years of age and older for about half of the States since 1982 (Table 7). Data are collected through random-digit-dialed telephone

interviews. Since 1984, the number of States participating in this surveillance system has increased steadily. For reporting States, median prevalence declined from 37 percent in 1982 to 24 percent in 1987. This decline exceeded the decline in national prevalence in the NHIS (Table 3), probably because of the nonrepresentative mix of States included in the BRFs in different years. In 1987, prevalence ranged from 15 percent in Utah to 32 percent in Kentucky.

#### *Current Population Survey: 1985*

In 1985, the Current Population Survey (CPS), a population-based, in-person household survey of more than 114,000 adult Americans, conducted by the U.S. Bureau of the Census, collected information about smoking and smokeless tobacco use. About 45 percent of interviews were conducted with proxy respondents. The survey estimated adult smoking prevalence (20 years of age and older) at 29.5 percent. Table 8 presents estimates of prevalence of cigarette smoking according to region of the country, census division, and State. Among the nine census divisions, prevalence was lowest in the Pacific (26.3 percent) and Mountain (27.2 percent) divisions and was highest in the East South Central (31.8 percent) and South Atlantic (31.3 percent) divisions.

Overall gender-specific prevalence was reported as 32.9 percent for males and 26.5 percent for females. Prevalence of smoking among males exceeded that among females in all States except Oregon and Wyoming (where the prevalence rates among men and women were either very similar or the same). Overall education-specific prevalence was 35.4 percent for persons with 12 years or less education (high school diploma or less) and 22.2 percent for persons with 13 or more years of education (some college or more education). Persons with 13 or more years of education reported lower smoking prevalence rates than those with 12 years or less education in all 50 States by a range of 20.2 percentage points in Tennessee to 5.7 percentage points in Hawaii.

**TABLE 7.—State-specific smoking prevalence (%), Behavioral Risk Factor Surveillance System, adults aged 18 years and older, 1982–87**

State	1982	1984	1985	1986	1987
Alabama	31			25	27
Alaska	36	34			
Arizona	32	28	26	24	26
Arkansas	27				
California	28	26	26	25	21
Colorado	34				
Connecticut			27		
Delaware	31				
District of Columbia	33	38	26	27	24
Florida	32		27	28	28
Georgia	29	37	29	27	25
Hawaii				25	23
Idaho		25	24	23	21
Illinois		34	26	28	26
Indiana	33	28	32	27	29
Iowa	30				
Kansas	22				
Kentucky	37		29	35	32
Maine					28
Maryland					25
Massachusetts				27	25
Michigan	31				
Minnesota		27	28	25	24
Missouri				26	29
Montana	26	29	25	23	22
Nebraska	23				
New Hampshire	29				
New Jersey	32				
New Mexico	29			26	21
New York			31	27	23
North Carolina	38	31	27	27	26
North Dakota		28	26	26	24
Ohio	30	29	29	28	27

**TABLE 7.—Continued**

State	1982	1984	1985	1986	1987
Pennsylvania	34				
Rhode Island		31	29	39	
South Carolina		26	29	27	25
South Dakota					25
Tennessee	32	32	28	28	28
Texas	30				
Utah		16	16	18	15
Virginia	34				
Washington					24
West Virginia	32	33	27	29	29
Wisconsin		27	25	26	26
Minimum	22	16	16	18	15
Maximum	38	38	32	35	32
Median	37	29	27	26	24
Number of States <sup>a</sup>	27	19	22	26	29

<sup>a</sup>Includes the District of Columbia.

NOTE: No data were available for the following States: LA, MS, NV, OK, OR, VT, and WY.

SOURCE: CDC (1986a,b, 1987f, unpublished data).

### *BRFS and CPS Comparison*

In 1985, both the BRFS and the CPS collected State-specific information on adult smoking prevalence. Among the 22 States (including the District of Columbia) where comparisons can be made, the CPS (an in-person household survey) estimated higher smoking prevalence in 13 States and lower prevalence in 8 States than the BRFS (a telephone survey). The median difference in smoking prevalence between the CPS and the BRFS was +1.8 percentage points. This pattern is similar to that observed in comparisons between the in-person NHIS and the telephone AUTS (see above).

**TABLE 8.—Smoking prevalence rates according to region of the country, census division, and State, adults aged 20 years and older, by gender and education, United States, CPS, 1985**

	Overall	Males	Females	Education	
				≤12 years	>12 years
<b>United States</b>	29.5	32.9	26.5	35.4	22.2
<b>Northeast Region</b>	28.9	31.3	26.8	34.5	22.1
New England Division	29.5	30.6	28.6	36.3	22.5
Maine	30.3	31.8	29.1	37.0	17.3
New Hampshire	30.7	35.2	26.7	37.4	21.0
Vermont	30.7	31.8	29.7	37.7	21.4
Massachusetts	28.2	28.4	28.1	35.0	22.9
Rhode Island	34.4	35.8	33.3	39.9	26.3
Connecticut	29.6	30.9	28.5	36.3	23.1
Mid-Atlantic Division	28.7	31.6	26.2	34.0	22.0
New York	28.7	31.4	26.3	34.1	22.3
New Jersey	27.9	31.0	25.2	33.6	21.7
Pennsylvania	29.3	32.3	26.6	34.0	21.7
<b>North Central Region</b>	30.2	32.4	28.1	36.2	22.2
East North Central Division	31.0	33.0	29.3	37.5	22.5
Ohio	32.2	34.4	30.3	38.6	22.0
Indiana	32.8	35.7	30.1	38.4	23.8
Illinois	28.7	31.5	26.3	35.0	22.7
Michigan	34.0	34.4	33.7	40.9	24.7
Wisconsin	26.3	27.6	25.2	32.6	17.9
West North Central Division	28.1	31.1	25.4	33.1	21.7
Minnesota	28.7	30.0	27.4	34.6	21.6
Iowa	28.1	33.0	23.7	31.8	22.2
Missouri	27.7	31.1	24.6	32.0	21.4
North Dakota	26.4	28.3	24.7	31.3	21.8
South Dakota	28.6	30.7	26.8	34.5	21.0
Nebraska	24.9	26.6	23.6	29.2	19.4
Kansas	30.2	34.6	26.6	37.1	23.1
<b>South Region</b>	31.2	36.4	26.8	36.5	23.3
South Atlantic Division	31.3	36.3	27.1	36.6	24.0
Delaware	31.8	34.9	29.1	39.1	19.0
Maryland	29.7	31.5	28.1	36.3	20.1

TABLE 8.—Continued

	Overall	Males	Females	Education	
				≤12 years	>12 years
District of Columbia	31.4	34.2	29.3	38.5	24.2
Virginia	32.7	37.8	28.5	38.5	26.3
West Virginia	34.0	38.6	30.0	38.1	22.9
North Carolina	31.6	39.7	24.6	37.0	24.0
South Carolina	27.1	34.2	21.5	31.7	18.4
Georgia	31.8	38.5	26.5	36.4	25.1
Florida	31.7	35.5	28.4	36.8	25.4
East South Central Division	31.8	37.6	26.9	37.3	21.8
Kentucky	35.3	37.8	33.4	40.2	22.5
Tennessee	30.8	36.6	26.0	38.6	18.4
Alabama	30.6	38.5	23.5	35.3	23.6
Mississippi	31.1	38.8	24.8	34.9	25.3
West South Central Division	30.6	35.5	26.3	35.9	22.8
Arkansas	31.3	37.2	26.5	34.8	25.0
Louisiana	29.1	35.4	23.8	34.1	21.1
Oklahoma	33.0	35.7	30.4	41.5	22.7
Texas	30.6	35.5	26.3	35.9	22.8
<b>West Region</b>	26.5	29.3	23.9	32.8	20.9
Mountain Division	27.2	30.1	24.6	34.7	20.2
Montana	25.9	26.1	25.9	32.2	19.3
Idaho	24.1	26.6	21.7	29.6	17.8
Wyoming	31.7	31.9	31.9	40.9	21.0
Colorado	28.6	30.6	26.9	37.9	21.9
New Mexico	28.5	32.6	24.3	32.8	24.4
Arizona	29.5	34.3	25.3	37.4	21.5
Utah	14.1	18.2	10.2	22.5	8.0
Nevada	35.7	37.6	33.9	39.0	31.4
Pacific Division	26.3	29.0	22.7	32.0	21.1
Washington	28.6	29.9	27.4	36.1	21.8
Oregon	27.1	26.8	27.5	34.7	21.2
California	25.6	28.9	22.5	28.3	20.8
Alaska	34.3	40.9	28.0	41.1	27.2
Hawaii	27.6	30.7	24.7	30.6	24.9

NOTE: Percentages are age adjusted to the total U.S. population.

SOURCE: Office on Smoking and Health, unpublished data.



## Summary

A number of national and State-based surveys provide information on cigarette smoking. These surveys have varying methodologies and response rates. The data of highest quality (large sample size, high response rate) are from the NHIS, and this source also has the best series of data for analyzing trends in smoking prevalence since 1965. Trend analysis demonstrates that smoking prevalence among adults overall is declining by 0.50 percentage points per year and this rate of decline has been consistent since 1965. If this rate of change continues for the next few years, overall prevalence will be 27 to 28 percent in 1990, which is higher than the 1990 Health Objective for the Nation (less than 25 percent) (US DHHS 1980a; see Chapter 1). Although there are differences between whites and blacks in smoking prevalence, the rate of change within each race has been similar in recent years. The decline has been much higher in men than in women and much higher in the more educated than in the less educated.

The consistency of the trends in these smoking prevalence data contrasts with the lack of year-to-year consistency in the consumption (excise tax) data presented in an earlier section. Given that both data sets report cigarette usage in the population, reasons for this difference need to be addressed. Each data set has its advantages. Excise tax data have the advantage of being an objective measure of manufactured-cigarette sales and are not subject to questions of validity that must be addressed with self-reported smoking from survey data. On the other hand, survey data provide information on smoking behavior in specific subpopulations within society.

Cigarette sales data, and trend analyses of these data, reflect both the number of people who smoke and the number of cigarettes each smoker consumes (plus a wastage and stock error term). On the other hand, trend analyses of self-reported smoking prevalence reflect only the number of people who smoke. Antismoking interventions may affect an individual's smoking status or daily cigarette consumption. For example, worksite smoking restrictions may induce some smokers to quit, whereas others who continue to smoke may smoke fewer cigarettes per day because of fewer opportunities to smoke. Similarly, increases in cigarette price (e.g., mediated by increased excise taxation) may induce price-sensitive smokers to quit or to reduce daily consumption.

While consumption data are often used as a more sensitive index of the relative impact of differing antismoking strategies, the primary goal of these strategies is a change in smoking prevalence. Smokers who reduce their daily cigarette consumption will reduce their health risks, but to a lesser extent compared with quitting entirely (see Chapters 2 and 3).

## Trends in Quitting

### Introduction

As the 1988 Surgeon General's Report documented (US DHHS 1988), cigarettes and other forms of tobacco are addicting. This addiction, including both pharmacologic and behavioral components, helps to explain the difficulty that most smokers experience in quitting and then maintaining abstinence. Smokers can be on a quitting cycle in which they are abstinent for a while, followed by a relapse to smoking for a period of time, after which they may quit again, and so on. Given this pattern, no single statistic can fully describe trends in quitting activity. Three interrelated statistics are:

1. *Percentage of former smokers.* The percentage of the population who are former smokers has been used as one indicator of quitting activity. For example, the total number of living persons who have quit smoking is often cited and is calculated by multiplying the proportion of the population who are former smokers by the size of the population. This figure, as calculated from the 1986 AUTS, is 43.2 million adults 17 years of age and older. However, the prevalence of former smokers is of limited value in assessing quitting activity because it does not take into account the number of people in the population who have ever smoked, because it does not include former smokers who have died, and because of marked differences in the initiation of smoking between males and females in different birth cohorts (Harris 1983; Warner and Murt 1982).
2. *Quit ratio.* This statistic is defined as the proportion of people who have ever smoked who are former smokers at a specific point in time; that is, the number of former smokers divided by the number of ever smokers (Pierce et al.1987a). Thus, this statistic is to quitting activity what smoking prevalence is to smoking activity. Both statistics consider the size of the population undertaking a behavior as a proportion of those who could undertake that behavior.

However, the quit ratio does not provide all the information needed when describing quitting activity. It does not distinguish between a person who has been a former smoker for 3 days and a person who has been off cigarettes for 10 years. It does not distinguish between a current smoker who has just relapsed after 6 years of abstinence and a current smoker who has never tried to quit. In addition, the quit ratio does not reflect the magnitude of smoking prevalence; for example, a group in which 10 percent are current smokers and 10 percent are former smokers has the same quit ratio as a group in which 30 percent are current smokers and 30 percent are former smokers.

3. *The smoking continuum.* This is a 10-category index of the total population derived from the smoking status variable (current, former, or never smoker) and timing and duration of quit attempts. This index is particularly relevant for describing which segments of the population are trying to quit.

Trends in the quit ratio using NHIS data and an analysis of the smoking continuum using data from the 1986 AUTS are presented below.

## Trends in the Proportion of Smokers Quitting (Quit Ratio) (NHIS)

Quit ratios for the total U.S. adult population and stratified by sex, race, and education, as derived from the 1965–87 NHISs, are presented in Table 9. Linear regression analyses of the weighted data from those surveys conducted between 1965 and 1985 are also provided to assess time trends. The 1987 data are not used in the regression analyses because they are preliminary. The linear models for the observed data in the subpopulations defined by sex, race, and education had  $R^2$  values all between 0.78 and 0.95.

In 1965, 29.6 percent of ever smokers had quit. By 1987, this proportion had increased to 44.8 percent. The rate of increase in the quit ratio between 1965 and 1985 is 0.68 percentage points per year. Almost half (48.7 percent) of male smokers had quit by 1987 compared with 40.1 percent of female smokers. The rate of increase in the quit ratio is the same among men and women.

Regarding racial differences, 46.4 percent of whites who had been smokers had quit by 1987 compared with 31.5 percent of blacks. For whites, the rate of change in the quit ratio from 1965–85 was 0.72 percentage points per year, and the linear model fits the data exceedingly well. For blacks, the rate of change during this period was 0.43 percentage points per year. As with smoking prevalence, the quit ratio for blacks did not change between 1965 and 1974 but did change between 1974 and 1985. Fiore and colleagues (1989) have reported trends from 1974–85; during this period the rate of increase in the quit ratio among blacks (0.75 percentage points per year) was similar to that among whites (0.77). However, this similarity masks a difference between the sexes. The change in the quit ratio among blacks from 1974–85 was mainly seen in males, where the rate increased at 1.04 percentage points per year (compared with 0.67 in white males). Among black females, the quit ratio increased at 0.46 percentage points per year from 1974–85 (compared with 0.95 in white females). Thus, in recent years, black males have been quitting smoking at a significantly higher rate of change than white males ( $p=0.01$ ). The difference in the rate of change between black and white females is in the opposite direction but is not statistically significant ( $p=0.31$ ) because of the reduced linearity of the trends and smaller sample sizes of ever smokers among females than among males.

In 1966, about 40 percent of college graduates who had ever been smokers had quit. This proportion was 20 to 40 percent higher than the other educational groups. By 1987, the quit ratio among college graduates had risen to 61 percent, and the rate of change from 1966–85 (+0.85 percentage points per year) was greater than in any other educational category. Quitting has been increasing in all the other educational categories, with the slowest rate of change (0.41 percentage points per year) among persons without a high school diploma.

## Smoking Continuum (AUTS)

The process of quitting smoking has been categorized by Prochaska and DiClemente (1983) according to smokers' intention to quit and the status of their most recent quit attempt. They labeled five stages of the quitting process as follows: precontemplation,

**TABLE 9.—Trends in smoking quit ratio (%), NHISs, United States, 1965–87, adults aged 20 years and older**

Year	Overall population	Sex		Race		Educational level			
		Males	Females	Whites	Blacks	Less than high school graduate	High school graduate	Some college	College graduate
1965 <sup>a</sup>	29.6	31.4	24.6	30.5	22.8				
1966	29.5	31.4	24.2	30.4	22.6	33.3	28.0	28.7	39.7
1970	35.3	37.9	29.2	36.7	23.2	38.1	33.6	34.9	48.2
1974	36.3	39.3	30.8	38.0	21.8	38.0	35.2	36.6	47.9
1976	37.1	39.9	32.1	38.4	26.3	39.5	35.0	37.2	46.1
1977	36.8	40.3	31.3	38.2	24.8	38.3	34.0	36.8	48.6
1978	38.5	41.3	33.8	39.9	27.5	38.7	36.3	41.0	49.7
1979	39.0	41.5	34.0	40.3	28.0	40.8	36.7	37.5	50.6
1980	39.0	41.5	34.0	40.4	27.7	39.4	36.5	40.6	48.7
1983	41.8	44.1	37.6	43.3	29.3	42.1	38.7	41.2	54.9
1985	45.0	49.0	40.0	46.7	31.8	41.3	40.5	46.0	61.1
1987 <sup>b</sup>	44.8	48.7	40.1	46.4	31.5	39.7	40.9	46.9	61.4
<b>Trend information (1965–85)</b>									
Change <sup>c</sup> /year	+0.68	+0.73	+0.73	+0.72	+0.43	+0.41	+0.57	+0.73	+0.85
Standard error (±)	0.05	0.06	0.05	0.06	0.07	0.06	0.07	0.10	0.16
R <sup>2</sup>	0.95	0.94	0.96	0.94	0.82	0.85	0.89	0.88	0.78

NOTE: Quit ratio = (Former Smokers/Current + Former Smokers)

<sup>a</sup>For 1965, data stratified by education were not available.

<sup>b</sup>Provisional data only.

<sup>c</sup>In percentage points.

SOURCE: NHISs 1965–87; unpublished data, Office on Smoking and Health.

contemplation, action, maintenance, and relapse. This categorization has proven useful in longitudinal research studies (see Part II of this Chapter and also Chapter 6); however, for cross-sectional population studies, this process of quitting can be analyzed according to current smoking status and the timing and duration of previous quit attempts. Thus, everyone can be classified on a smoking continuum.

This continuum is presented in Table 10. It is based on questions from the AUTS (see Appendix to this Chapter). Ten different categories are presented as percentages of the total population and as percentages of ever smokers. Categories of current smokers can also be described as percentages of all current smokers. These percentages are not provided below because of the possibility of misinterpretation. In particular, the percentage of those attempting to quit during the past year should not be calculated using current smokers as the denominator because this percentage excludes those who *successfully* quit during the past year. Instead, a more appropriate denominator (used below) would be those who were smokers at any time during the past year (including former smokers who quit during the past 12 months).

**TABLE 10.—Smoking continuum, adults aged 17 years and older, United States, 1986**

		Percentage of population	Percentage of ever smokers
Category 1	Never smokers	47.3	
Category 2	Former smokers who had quit 5 or more years ago	14.7	27.9
Category 3	Former smokers who had been abstinent for 1 to 5 years	5.7	10.8
Category 4	Former smokers who had been abstinent for 3 to 12 months	2.0	3.8
Category 5	Former smokers who had quit within the last 3 months	3.2	6.1
Category 6	Current smokers who had quit for 7 or more days in the past year	3.9	7.4
Category 7	Current smokers who had quit for 1–6 days in the past year	2.0	3.8
Category 8	Current smokers who had quit previously but not in the last year	11.6	22.0
Category 9	Current smokers who had never tried to quit but who had thought about it or would quit if there was an easy way to do so	5.4	10.2
Category 10	Current smokers who had never tried to quit, had not thought about it, and would not try to quit even if there was an easy way to do so	4.5	8.5

SOURCE: AUTS 1986 (US DHHS, in press, a).

The first category on this continuum includes those who have never smoked cigarettes. In 1986, 47.3 percent of the U.S. population 17 years of age and older was in this category. Former smokers who had quit smoking 5 or more years previously made up 14.7 percent of the population and 27.9 percent of ever smokers. Those in this category can be considered to be confirmed ex-smokers who are unlikely to relapse. Former smokers who had been abstinent for 1 to 5 years represented 10.8 percent of ever smokers. Former smokers who had been abstinent for less than a year represented 9.9 percent of ever smokers (categories 4 and 5 combined). Current smokers who had quit smoking for 7 or more days during the past year made up 7.4 percent of ever smokers. Another 3.8 percent of ever smokers had quit during the past year but were not able to stay off cigarettes for a week or more. Combining categories 4 through 7, 21.1 percent of ever smokers stopped smoking for at least 1 day during the year prior to the 1986 survey. This is 34 percent of all those who smoked that year.

Of ever smokers, 22.0 percent were current smokers who had previously made a serious quit attempt but not during the past year. Approximately 19 percent of ever smokers were current smokers who had never tried to quit; 45 percent of these have never thought about quitting and say that they would not quit even if there was an easy way to do so. Of those who had smoked during the past year, 70 percent had made at least one quit attempt (categories 4 through 8 divided by categories 4 through 10).

For the sake of convenience, category 10 is referred to below as the “hard-core smokers” category. However, it should be noted that others might also use this term to describe smokers who have failed to quit despite repeated attempts.

Tables 11 and 12 give the distribution for this smoking continuum by gender, education, race, and age. There are large differences between the subgroups in the proportion of ever smokers who are long-term abstainers (category 2). Males are more likely to be in this category than females, whites more than blacks, older people more than younger people, and the most highly educated more than the less well educated. The percentages of ever smokers in the categories reflecting recent quitting activity (4 through 7) and no recent quitting activity (8 through 10) were slightly higher for women than for men, probably resulting from the higher percentage of men in the combined categories 2 and 3 (abstinence for a year or more).

Educational differences in the smoking continuum are generally consistent with educational differences in smoking prevalence and quit ratio mentioned above. The proportion of ever smokers who have *not* tried to quit during the past year (categories 8 through 10) is 43.5 percent for the least educated group compared with 29.1 percent for the most educated group. The proportion in the hard-core smokers category is 9.8 percent for the least educated group compared with only 5.7 percent for the most educated group. However, the proportion of those who *have* made a quit attempt during the past year (categories 4 through 7) is also higher for the least educated group than for the most educated group (21.8 percent and 17.2 percent, respectively); this latter difference may reflect a lower success rate for quitting attempts among the least educated group. The differences between the least and most educated in these categories (4 through 7) become progressively smaller and then disappear as one moves from failed quit attempts during the past year (categories 6 and 7) to successful quit attempts

TABLE 11.—Smoking continuum by sex and education, percentage of ever smokers, United States, 1986

	Sex		Education			
	Males (%)	Females (%)	≤11 years (%)	12 years (%)	13–15 years (%)	≥16 years (%)
<b>Smoking continuum</b>						
Smokers who never tried to quit (10) <sup>a</sup>	8.3 (8.3) <sup>b</sup>	9.1 (9.1)	9.8 (9.8)	9.5 (9.5)	7.7 (7.7)	5.7 (5.7)
Smokers who never tried to quit (9)	9.1 (17.4)	9.6 (18.7)	9.8 (19.6)	9.5 (19.0)	10.9 (18.6)	5.7 (11.4)
Smokers not quitting in the last year (8)	21.5 (38.9)	23.9 (41.7)	23.9 (43.5)	22.5 (41.5)	22.5 (41.1)	17.7 (29.1)
Smokers quitting 1–6 days in the last year (7)	3.4 (42.3)	4.6 (46.3)	4.4 (47.9)	4.9 (46.4)	2.6 (43.7)	1.5 (30.6)
Smokers quitting 7 or more days in the last year (6)	6.5 (48.8)	8.6 (54.9)	7.4 (55.3)	7.9 (54.3)	8.6 (52.3)	5.0 (35.6)
Ex-smokers 0–3 months (5)	6.8 (55.6)	5.2 (60.1)	6.6 (61.9)	5.4 (59.7)	6.0 (58.3)	7.0 (42.6)
Ex-smokers 3–12 months (4)	3.6 (59.2)	4.3 (64.4)	3.4 (65.3)	4.1 (63.8)	4.7 (63.0)	3.7 (46.3)
Ex-smokers 1–5 years (3)	10.9 (70.1)	10.7 (75.1)	7.8 (73.1)	10.7 (74.5)	12.8 (75.8)	14.0 (60.3)
Ex-smokers ≥5 years (2)	30.1 (100)	25.1 (100)	27.2 (100)	25.3 (100)	24.4 (100)	39.2 (100)

<sup>a</sup>Category on the smoking continuum (see Table 10 for definitions).<sup>b</sup>Numbers in parentheses are cumulative percentages.

SOURCE: AUTS 1986 (US DHHS, in press, a).

**TABLE 12.—Smoking continuum by race and age, percentage of ever smokers, United States, 1986**

	Race		Age			
	Whites (%)	Blacks (%)	18–24 years (%)	25–44 years (%)	45–64 years (%)	≥65 years (%)
<b>Smoking continuum</b>						
Smokers who never tried to quit (10) <sup>a</sup>	8.7 (8.7) <sup>b</sup>	8.6 (8.6)	9.1 (9.1)	6.9 (6.9)	8.3 (8.3)	7.4 (7.4)
Smokers who never tried to quit (9)	8.9 (17.6)	12.3 (20.9)	18.4 (27.5)	10.6 (17.5)	7.5 (15.8)	3.6 (11.0)
Smokers not quitting in the last year (8)	22.2 (39.8)	22.2 (43.1)	16.3 (43.8)	26.4 (43.9)	21.6 (37.4)	14.5 (25.5)
Smokers quitting 1–6 days in the last year (7)	3.6 (43.4)	6.9 (50.0)	7.2 (51.0)	4.4 (48.3)	3.2 (40.6)	2.1 (27.6)
Smokers quitting 7 or more days in the last year (6)	7.0 (50.4)	10.7 (60.7)	19.3 (70.3)	8.6 (56.9)	4.7 (45.3)	2.0 (29.6)
Ex-smokers 0–3 months (5)	5.9 (56.3)	7.5 (68.2)	7.2 (77.5)	5.8 (62.7)	6.2 (51.5)	8.2 (37.8)
Ex-smokers 3–12 months (4)	4.0 (60.3)	3.3 (71.5)	9.0 (86.5)	4.3 (67.0)	3.2 (54.7)	2.5 (40.3)
Ex-smokers 1–5 years (3)	10.8 (71.1)	9.4 (80.9)	10.3 (96.8)	11.4 (78.9)	9.9 (64.6)	10.1 (50.4)
Ex-smokers ≥5 years (2)	28.8 (100)	19.0 (100)	3.0 (100)	20.6 (100)	35.6 (100)	49.7 (100)

<sup>a</sup>Category on the smoking continuum (see Table 10 for definitions).

<sup>b</sup>Numbers in parentheses are cumulative percentages.

SOURCE: AUTS 1986 (US DHHS, in press, a).



during the past year (categories 4 and 5). For prolonged abstinence (1 or more years) (categories 2 and 3), the proportions then become greater for the more educated.

Among ever smokers, about two-fifths of both blacks and whites have not tried to quit during the past year, with 9 percent in the hard-core smokers category. Twenty-one percent of white ever smokers have made a quit attempt during the past year compared with 28 percent of blacks.

A person's likelihood of being in different categories of the smoking continuum differs considerably with age. About 44 percent of ever smokers between the ages of 25 and 44 years are smokers who have not made an attempt to quit during the past year, compared with 26 percent of those 65 years of age and older. However, there are roughly equal proportions of each age group in the hard-core smokers category. The proportion of ever smokers who made a quit attempt in the last year was highest (42.7 percent) in the youngest age group (18 to 24 years old) and is progressively smaller for each older age group (23.1 percent, 17.3 percent, and 14.8 percent, respectively, in those aged 25 to 44 years, 45 to 64 years, and 65 years and older).

## Summary

As with trends in smoking status, trends in quitting activity have exhibited a consistent pattern since 1965. Almost half of the population who have ever been smokers have quit. Although the proportion of males who have quit is higher than that of females and the proportion of whites who have quit is higher than that of blacks, the rate of increase in the quit ratio is similar between these categories. The only diverging trend over time is the quitting activity for the less educated compared with the more educated.

One-third of those who smoked during the year prior to the 1986 AUTS quit smoking for at least 1 day during that year. Health education and motivational campaigns targeted at these individuals could help maintain them in "contemplation" and "action" stages (Prochaska and DiClemente 1983) and move them toward repeated quit attempts (see Part II).

## Trends in the Proportion of Smokers Who Are Heavy Smokers

Although all the NHISs have included information on the number of cigarettes smoked per day, respondent rules on this question changed in 1974. Prior to that date, smoking information was obtained from either the sampled individual or a proxy adult living in the same household. For each survey since the 1974 NHIS, smoking information has been accepted only from the sampled individual. Proxy respondents have been shown to be less accurate in reporting daily cigarette consumption than self-respondents (US DHEW 1969, p. 794; Rogot and Reid 1975; National Research Council 1986, pp. 110–112). Proxy responses can be eliminated from analyses of the pre-1974 data to examine long-term trends in daily cigarette consumption. However, excluding proxy responses may make the sample nonrepresentative (see Chapter 3). Accordingly, in considering trends in the proportion of the smoking population who smoke 25 or more cigarettes per day, only NHIS data from 1974–85 are used here.

The proportion of smokers who smoked 25 or more cigarettes per day in each survey is presented in Table 13 and is shown in Figure 1. This proportion ranged from 25.5 to 29.8 percent and did not change significantly from 1974 through 1985 ( $p=0.4$ ). In addition, this proportion did not change among sex- and race-specific subgroups of the smoking population (Figure 2) or in different age groups (NCHS 1988c). Heavy smoking has been consistently more common among whites compared with blacks, and among men compared with women; the differential by race has been greater than the differential by sex (Figure 2).

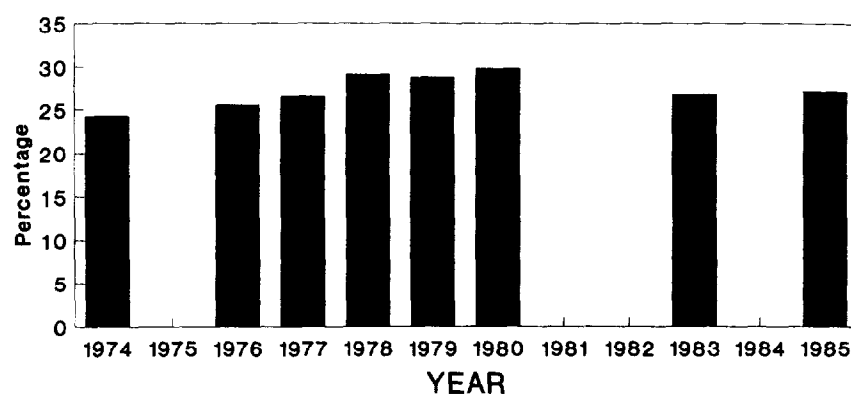
**TABLE 13.—Self-reported cigarettes smoked per day (percentage of current smokers), United States, aged 20 years and older, 1974–85**

Year	Number of cigarettes smoked per day		
	1–14	15–24	≥25
1974	30.8	43.2	26.0
1976	30.1	44.4	25.5
1977	30.3	43.2	26.5
1978	28.1	42.8	29.1
1979	28.2	43.0	28.8
1980	27.6	42.6	29.8
1983	28.5	44.9	26.6
1985	31.0	41.9	27.1

SOURCE: NHISs 1974–85; unpublished data, Office on Smoking and Health.

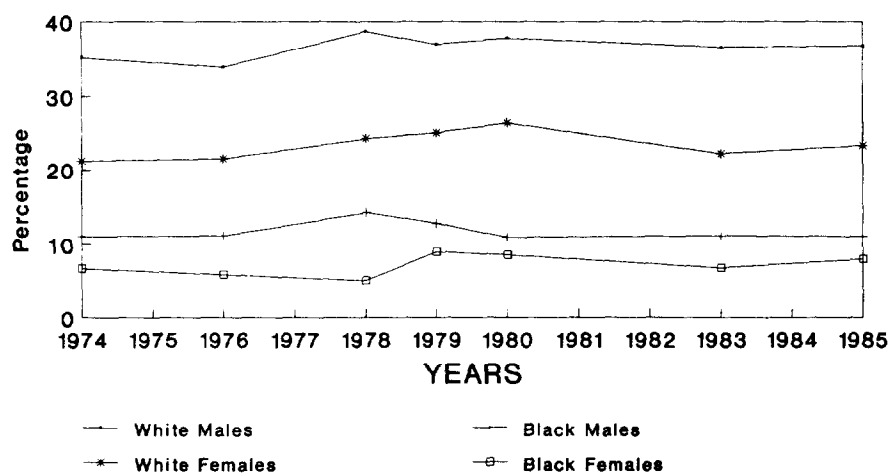
It is theoretically possible that the proportion of the “heaviest” smokers is increasing even though the proportion of “heavy” smokers (25 or more cigarettes per day) has not changed. However, no major increase occurred from 1974–85 in the proportion of smokers smoking 40 or more cigarettes per day (Table 14). The overall proportion smoking 40 or more cigarettes per day was 12.6 percent in 1974 and 13.2 percent in 1985. Table 14 also demonstrates respondents’ inclination to report their daily cigarette consumption in round numbers related to the size of a cigarette pack (e.g., 10 or 20 cigarettes per day) (see Kozlowski 1986).

Because the sales-weighted average nicotine yield declined from 1974–83 (see Figure 14 in Chapter 2), one might expect to have observed an increase in average daily cigarette consumption. Compensatory changes in smoking behavior to maintain relatively constant nicotine intake have been shown to occur when smokers switch from high-yield to lower yield cigarettes (US DHHS 1988). Although daily cigarette consumption did not increase from 1974–85, other compensatory changes may have occurred (e.g., increased frequency of puffing or depth of inhalation) as the smoking population moved toward lower yield brands.



**FIGURE 1.—Percentage of current smokers smoking  $\geq 25$  cigarettes per day, adults aged 20 years and older, United States, 1974–85**

SOURCE: NHISs 1974–85; unpublished data, Office on Smoking and Health.



**FIGURE 2.—Percentage of current smokers smoking  $\geq 25$  cigarettes per day, by race and gender, adults aged 20 years and older, United States, 1974–85**

SOURCE: NHISs 1974–85; unpublished data, Office on Smoking and Health.

**TABLE 14.—Self-reported cigarettes smoked per day (percentage of current smokers) by sex and race, United States, aged 20 years and older, 1974 and 1985**

Cigarettes per day	Sex						Race			
	Overall		Males		Females		Blacks		Whites	
	1974	1985	1974	1985	1974	1985	1974	1985	1974	1985
1-9	15.0	15.0	12.0	12.5	18.3	17.7	30.0	28.1	12.7	12.8
10	12.6	12.6	9.9	10.2	15.6	15.1	21.9	21.3	11.4	11.2
11-19	10.9	11.3	10.0	10.9	12.0	11.7	14.8	14.1	10.3	10.9
20	35.1	32.9	35.5	32.4	34.5	33.5	23.9	26.1	36.7	33.9
21-39	13.8	15.0	16.8	17.2	10.7	12.6	5.1	5.8	15.1	16.6
40	10.1	9.5	12.3	11.9	7.5	7.0	3.7	3.0	11.0	10.6
≥41	2.5	3.7	3.5	4.9	1.4	2.4	0.6	1.6	2.8	4.0

SOURCE: NHISs 1974, 1985 (unpublished data, Office on Smoking and Health).

## Trends in the Initiation of Smoking

Information on smoking patterns during adolescence is important because smoking initiation usually occurs during this age. Presented below are data concerning three measures of smoking behavior during adolescence: (1) age of smoking initiation; (2) trends in smoking prevalence among persons 20 to 24 years of age, used as an indicator of smoking initiation; and (3) smoking prevalence among adolescents.

Data on age of initiation provide information on the ages during which initiation usually occurs, but provide no information on the extent of tobacco use within the adolescent population. The prevalence of smoking among those 20 to 24 years of age serves as an indicator of smoking initiation among adolescents during the several years preceding a particular survey. This measure offers the advantages that smoking initiation is relatively complete by the time one enters this age group, and a survey sample representative of the total age-specific population can be obtained readily. However, these data offer no information on the ages during which smoking initiation actually occurred and do not necessarily reflect the most current initiation patterns among adolescents. Data on smoking prevalence among adolescents provide direct and current information on smoking behavior in the population of concern. However, interpretation of adolescent survey data is complicated by the use of different definitions of regular and experimental smoking in different surveys and by the failure of some surveys (e.g., school surveys of high school seniors) to include groups known to smoke at higher rates (e.g., high school dropouts).

### Age of Initiation

Age of smoking initiation is a critical variable in targeting prevention efforts. Information on self-reported age of initiation is available from surveys of adolescents and adults. Adolescent surveys offer the advantage of providing current information on age of initiation without concerns of recall bias. However, these surveys cannot provide complete information on age of initiation because the samples exclude those who may start smoking at older ages. Adult surveys provide complete information on age of initiation, but recall bias may occur because adults are asked about an event (smoking initiation) that typically occurred decades earlier. A major value of an adult survey is that, by using birth cohorts, one can assess whether smoking initiation has changed over time.

In the 1986 High School Seniors Survey sponsored by NIDA (see below), seniors who had ever smoked were asked the grade in which they had smoked their first cigarette. About one-quarter of seniors smoked their first cigarette by grade 6, one-half by grade 8, three-fourths by grade 9, and 94 percent by grade 11 (Table 15). Males and whites were more likely to smoke their first cigarette at earlier grades than females and blacks, respectively. The pattern of smoking initiation was similar for those with and without plans for higher education.

In addition, the 1987 National Adolescent Student Health Survey (NASHS) (see below) collected information on the grade in which 8th and 10th grade students had smoked their first cigarette. Data are presented in Table 16 for 10th graders only. Ap-

**TABLE 15.—Grade by which ever smokers smoked their first cigarette (%),  
reported by high school seniors, United States, 1986**

Grade	Total	Males	Females	Whites	Blacks	Higher education plans	
						Yes	No
6	25.8	31.1	20.7	26.8	23.3	25.3	25.7
8	57.3	59.5	55.3	59.0	50.2	56.5	58.0
9	72.5	72.7	72.5	74.0	65.8	70.8	75.3
10	84.2	83.8	84.7	85.0	78.4	83.0	86.7
11	94.3	93.8	95.0	95.3	89.9	93.5	95.9
12	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size	3,079	1,423	1,526	2,308	302	1,791	972

SOURCE: Institute for Social Research, University of Michigan (Bachman, Johnston, O'Malley 1987).

proximately one-quarter of smokers reported that they had started smoking by grade 6 and approximately one-half of smokers had started by grade 7 or 8. Males were somewhat more likely than females to start smoking prior to grade 7, but females caught up by grade 9 due to their higher initiation rates in grades 7 to 9.

**TABLE 16.—Recall of grade at smoking initiation by 10th-grade students, United States, 1987**

	Males		Females	
	%	Cumulative %	%	Cumulative %
By grade 4	11.0	11.0	8.5	8.5
Grades 5 or 6	17.9	28.9	14.0	22.5
Grades 7 or 8	24.1	53.0	26.1	48.6
Grade 9	6.9	59.9	10.9	59.5
Grade 10	2.1	62.0	4.6	64.1
Not smoking by grade 10	38.1	100.0	35.9	100.0

SOURCE: National Adolescent Student Health Survey 1987 (US DHHS, in press, b).

Information on age of initiation is available for adults from NHISs conducted in 1978, 1979, 1980, and 1987. The 1987 data were not available for inclusion in the data presented below. The 1978–80 data are derived from responses to the question, “About how old were you when you first started smoking cigarettes fairly regularly?” These data have been used in previously published analyses of age of smoking initiation (US DHHS 1985; Harris 1983; McGinnis, Shopland, Brown 1987) and are again used below. The populations from the three NHISs were combined and grouped by 5-year birth cohorts. In the total sample, the average age of initiation among ever smokers (aged 20 to 64 years) was 17.2 for men and 19.1 for women (US DHHS 1985). The proportion of ever smokers (20 years of age and older) within each birth cohort who

had started smoking before different ages is presented separately for males and females in Table 17 and Figures 3 and 4.

Among smokers born since 1935, more than four-fifths started smoking before age 21 and almost half started before age 18. The data reveal few differences across birth cohorts in age of initiation before age 16. However, for more recent birth cohorts, there has been a tendency for a higher percentage of ever smokers to have initiated smoking before age 18 or 21. The proportion starting before age 18 has increased from 38 percent of ever smokers born from 1910–14 to approximately half of ever smokers born between 1950 and 1954. The proportion starting before age 21 has increased between these two birth cohorts from 66 to 87 percent (Table 17). Stratifying by sex shows that this tendency for more recent birth cohorts to initiate smoking at a younger age has occurred among both sexes but has been more striking among females (Figures 3 and 4).

The data from the earliest birth cohorts may be biased somewhat by differential mortality among smokers with different ages of initiation. Mortality rates for smoking-related diseases are higher for smokers with younger ages of initiation (US DHHS 1982, 1983, 1984). Thus, the age of initiation data may be biased upward among, for example, the 1910–19 birth cohort, whose members were 61 to 70 years old in the last survey year included in these data (1980). However, the trend noted above toward declining age of initiation, especially among females, is still apparent when considering only those born since 1930. As pointed out above, the decline in age of initiation among males is only seen in the proportion of ever smokers starting before age 21.

In summary, these data indicate that uptake of smoking is now a phenomenon that occurs almost entirely during the teenage years and that the initiation of smoking is occurring at younger ages among more recent birth cohorts, especially among females. Data from the 1986 AUTS on age of initiation of smokeless tobacco use are presented in the Section on Smokeless Tobacco later in this Chapter.

#### Prevalence in 20- to 24-Year Age Group

The most complete ascertainment of smoking initiation would involve the collection of longitudinal data on children from the ages of about 9 to 21 years. Such complete population-based information for the United States is not available. However, trends in smoking prevalence in the 20- to 24-year age group (Table 18), as determined by the NHIS, provide an indirect measure of trends in smoking initiation. Using this measure has the advantage that smoking initiation is relatively complete by age 20. However, there is a lag of several years between actual initiation during adolescence and prevalence in this group. The  $R^2$  values for the regression lines derived from these data are above 0.70 for sex-, race-, and education-specific groups, except for females overall, among whom initiation rates varied considerably.

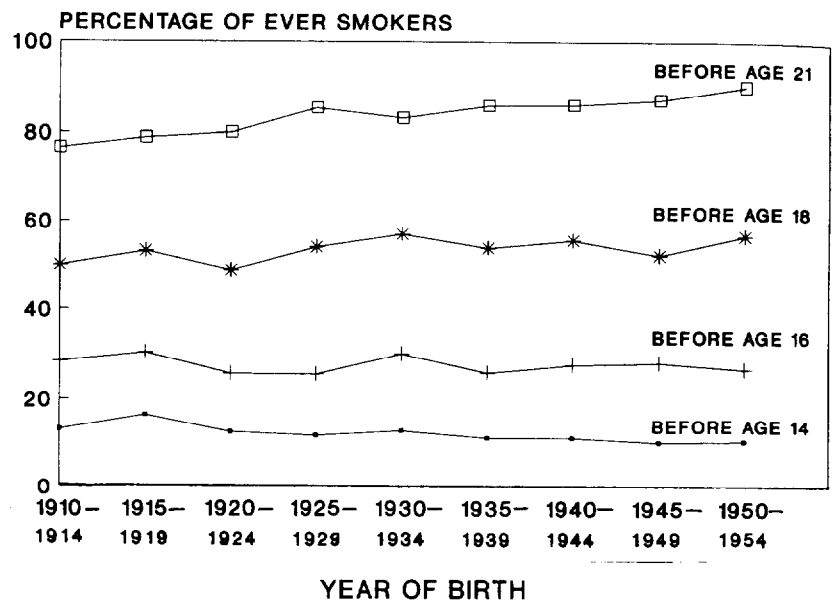
From 1965–87, smoking initiation, as measured by prevalence among those aged 20 to 24 years, decreased from 47.8 percent to 29.5 percent, at a rate of decline from 1965–85 of 0.69 percentage points per year. There are marked gender differences in this measure of initiation. Smoking prevalence among young males has fallen from 56.3 percent in 1965 to 31.1 percent in 1987 at a rate of change (1965–85) of –1.19 percentage points per year. In contrast, smoking prevalence among young females has fallen

**TABLE 17.—Proportion of ever smokers (%) who started smoking before various ages, by gender, birth cohorts from NHISs**

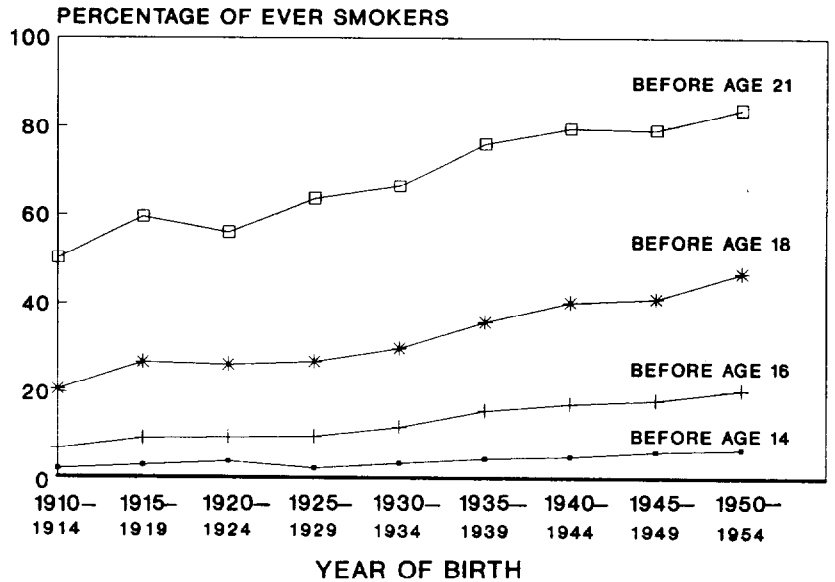
Age at smoking initiation		Year of birth								
		1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54
<14	Overall	8.9	11.0	9.2	8.1	8.8	8.3	8.5	8.5	8.6
	Male	13.0	16.3	12.5	11.7	12.8	11.1	11.1	10.1	10.3
	Female	2.6	3.4	4.2	2.7	3.7	4.7	5.1	6.1	6.6
<16	Overall	20.0	21.6	19.5	19.1	22.2	21.3	23.0	23.7	23.8
	Male	28.4	30.3	25.7	25.5	30.1	25.9	27.7	28.2	26.8
	Female	7.2	9.5	9.7	9.8	11.9	15.6	17.1	17.9	20.2
<18	Overall	38.3	42.1	40.0	42.9	45.0	46.0	48.5	47.2	52.0
	Male	49.9	53.1	48.7	54.0	56.9	53.8	55.6	52.2	56.6
	Female	20.6	26.7	26.2	26.8	29.8	35.6	40.1	40.9	46.7
<21	Overall	66.2	70.8	70.7	76.5	75.6	81.7	83.1	83.8	87.3
	Male	76.5	78.8	79.9	85.4	83.1	85.9	86.1	87.3	90.3
	Female	50.3	59.5	56.0	63.5	66.3	75.9	79.5	79.1	83.8
<25	Overall	78.0	83.2	86.9	88.8	90.0	92.7	93.8	95.5	97.7
	Male	88.7	90.4	93.8	95.2	95.0	95.0	96.3	97.8	98.5
	Female	61.9	72.6	75.8	79.5	83.7	89.5	90.9	92.7	96.7

SOURCE: NHISs 1978, 1979, 1980 combined (unpublished data, Office on Smoking and Health).





**FIGURE 3.—Age by which males started smoking, by birth cohort**  
 SOURCE: NHISs 1978-80, combined (unpublished data, Office on Smoking and Health).



**FIGURE 4.—Age by which females started smoking, by birth cohort**  
 SOURCE: NHISs 1978-80, combined (unpublished data, Office on Smoking and Health).